

Name: \_\_\_\_\_

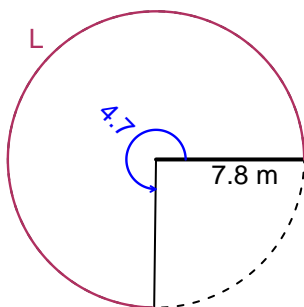
Date: \_\_\_\_\_

## Trig Final (Solution v26)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 7.8 meters. The angle measure is 4.7 radians. How long is the arc in meters?

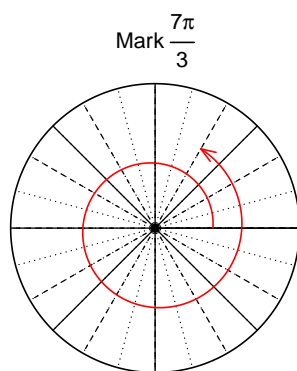


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 36.66$  meters.

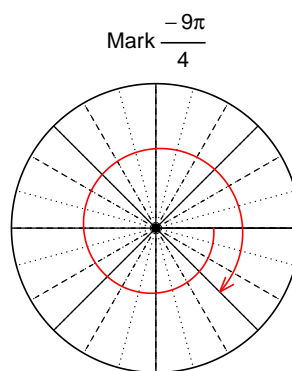
### Question 2

Consider angles  $\frac{7\pi}{3}$  and  $-\frac{9\pi}{4}$ . For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for  $\sin\left(\frac{7\pi}{3}\right)$  and  $\cos\left(-\frac{9\pi}{4}\right)$  by using a unit circle (provided separately).



Find  $\sin(7\pi/3)$

$$\sin(7\pi/3) = \frac{\sqrt{3}}{2}$$



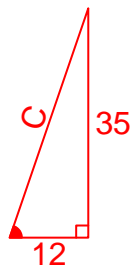
Find  $\cos(-9\pi/4)$

$$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$$

### Question 3

If  $\tan(\theta) = \frac{-35}{12}$ , and  $\theta$  is in quadrant IV, determine an exact value for  $\cos(\theta)$ .

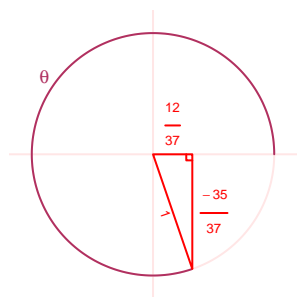
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}12^2 + 35^2 &= C^2 \\ C &= \sqrt{12^2 + 35^2} \\ C &= 37\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{12}{37}$$

### Question 4

A mass-spring system oscillates vertically with a frequency of 3.63 Hz, an amplitude of 8.35 meters, and a midline at  $y = 6.66$  meters. At  $t = 0$ , the mass is at the midline and moving up. Write an equation to model the height ( $y$  in meters) as a function of time ( $t$  in seconds).

Any of these equations would get full credit.

$$y = 8.35 \sin(2\pi 3.63t) + 6.66$$

or

$$y = 8.35 \sin(7.26\pi t) + 6.66$$

or

$$y = 8.35 \sin(22.81t) + 6.66$$